Operation RIO Update

17 October 2003

Major Tom Langlois, USMC, Oil expert. See "Oil 101" below.

An update for all SWD employees and Operation RIO volunteers supporting Operation Iraqi Freedom.

Mission Update: TWO MILLION!! For the past four consecutive days, RIO and the Iraqi Oil Ministry have been able to produce more than 2 million barrels of crude per day. Our production goals remain 2.5 million barrels per day by 31 March 04 and 3.0 million barrels per day by 31 Dec 04. A free Iraq is exporting more than a million barrels of oil per day with total exported to date approaching 80 million barrels. We are consistently meeting or exceeding the daily requirements for refined products through refinery production and imports.

We continue to make significant progress helping Iraq restore and rebuild their oil infrastructure. We are on schedule executing the joint work plan developed in July. Together with the Iraqis we will execute more than half the $1.4 billion program in the next couple months and will import more than $250 million worth of diesel, propane, gasoline and kerosene. Much of the repair and restoration work is being performed by the Ministry of Oil (MOO) operating companies. The Iraqi State Oil Marketing Organization (SOMO) alone handles all exports of crude oil. SOMO is also importing diesel, gasoline, kerosene and LPG in exchange for crude oil by-products with other Arab countries by truck and barge. SOMO will import fuels for the first time this month on a cash basis and will eventually assume full responsibility for any necessary import of fuels.

We welcome Colonel Lem Dubose to TF-RIO who took Col Rick Jenkins' place, TF-RIOs deputy and chief of staff for the last 6 months. Col Jenkins did a super job synchronizing our operational, administrative and logistics efforts with CJTF-7, CFLCC, CPA and SWD staff to get the job done. He went back to his other Corps job, Deputy Commander for MVD.

"Oil 101"
by Wayne Stroupe

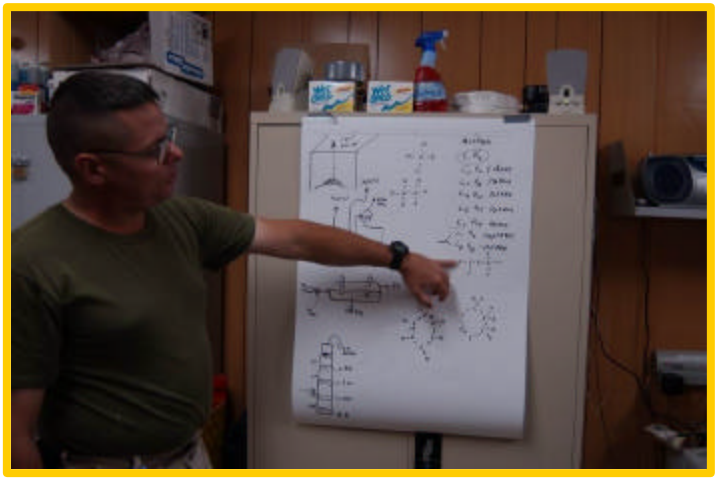
All right, how many of you folks out there in the Corps of Engineers know about oil and petroleum production? Let's see a show of hands.

Thought so, not too many. Task Force Restore Iraqi Oil (RIO) found that same thing out when the mission to help Iraq repair and reconstruct its oil infrastructure came along. RIO ended up tapping several subject matter experts outside the Corps to join our merry band of Castle workers to provide the needed expertise. RIO's Southern Area Office near Basrah, was fortunate to get a 416th Army Engineer Reserve Command captain that was activated from his job with an oil distribution company near Chicago, a U.S. Marine Corps major with a degree in the field, and a British captain who was activated from the petroleum industry in the United Kingdom.

Since my oil knowledge was pretty much limited to what type of oil to put in my truck, I asked our Marine Corps petroleum expert, Maj. Tom Langlois, to give me a short course about oil production--"Oil 101" if you will. No tests, not too technical, just basic info. The course objective; how do oil and other petroleum ingredients from the black stuff in the ground become processed energy products for industry, homes, and transportation? What are the various process steps, the products that can be produced, and most important to us RIO folks, what are the facilities required for petroleum production (since we are helping repair and reconstruct them). Most of us just look at a bunch of tanks, pipelines, towers, and other facilities and say, "That's nice…."

When asked about oil, Langlois' eyes gleamed. Maj. Langlois instantly became Major Professor Langlois. Grab a flip chart, get a marker, pull your chairs up – class is in session.

Crude oil is basically a mix of hydrocarbons. The smaller, lighter ones are generally called "natural gases": methane, ethane, propane and butane. The next larger and heavier group, or family, is called "natural gasolines": pentane, hexane, heptane, and octane. The next general family of compounds increases in size and complexity: light naphtha, heavy naphtha, paraffins, heavy oils and tars. The "natural gases" end of the spectrum contains the lighter natural gases that are simple compounds with lower temperature boiling points. The "tars" end of the list contains the heavier materials, with more complicated compounds and higher temperature boiling points. These are important factors to remember since the production processes for oil, natural gas, and gasoline are all basically distillation methods done at different temperatures.



When the oil comes out of the ground at a well in Iraq, it usually comes through a six- to nine-inch-diameter hole from about two miles down. In the southern Iraqi oilfields, high yield wells produce oil typically about 400 degrees in temperature and about 600 pounds per square inch of pressure – it is basically very hot and under high pressure.

GOSP

The first stop for the oil is a gas-oil separation plant, simply referred to as a GOSP. Most of the GOSPs in Iraq serve 12 to 50 oil wells. A GOSP setup is typically three separate tanks or "stages" as they are called. Each set of three stages is called a "train." Most of the smaller GOSPs have a single train, some of the larger GOSPs have several trains; GOSP 3R in southern Iraq has five.

Crude oil comes into the first stage tank and pressure is dropped to around 200 pounds per square inch. This releases the first light gas, methane. This methane can either be burned at a flare at the GOSP (the usual case in Iraq) or sent to a compressor station and forwarded to the national natural gas pipeline to be used as fuel in the power plants. At the GOSP's second stage, the pressure is dropped to 100 pounds per square inch. (Keep in mind these pressures are typical for southern Iraq but every oilfield is different.) This normally releases the ethane to heptane compounds. These gases can also be burned at a separate flare at the GOSP or sent to an NGL (Natural Gas Liquids) plant.

The third GOSP stage tank is almost always elevated. It is basically atmospheric or surface pressure. The remaining gas that is released is either burned at a separate third flare or sent to an NGL plant. GOSP flares are normally in sets of three with each flare for the separate stage. The first stage flare usually burns a very bright flame with no smoke since it is primarily methane. The second flare burns a smokier, and the third flare is usually black smoke with orange flame due to the increased amount of heavier compounds, and often some oil, in the gas mixture.

At the bottom of the GOSP's third-stage tank is the first processed crude oil. In the southern Iraq oilfields, the gas cut is approximately 20 percent; for every 100 barrels of oil out of the ground, you get 80 barrels of crude. At atmospheric or normal pressure, this crude oil is easy to pump and handle.

It's Magic

The next process dewaters and desalts the crude. At the desalter, water is added at an "emulsifier valve," which is basically a blender that mixes the oil with fresh water. After mixing, the crude is squirted or forced into a tank. Electrical transformers put high voltage (several thousand volts) into a series of electrical grids in this tank to provide an electrostatic charge. This electric charge separates the water from the crude by a process that in my opinion is indistinguishable from magic. The crude oil rises while the water sinks, and the water holds the salt that was in the crude. (The scholarly major offered to explain the chemical principle behind this process to me, but I was afraid my brain might explode!) This whole process only takes a couple of seconds, but it is very tricky. You can get bad crude oil (high water content) if it is not done correctly. In the United States, the valves controlling this process are automatic; in Iraq, the valves are controlled and constantly adjusted by men. The waste brine, or heavily salted water, solution is usually sprayed on an open desert area. Out of the top of the tank comes desalted, dewatered oil – dry crude.

The dry crude is then sent via pipeline to a pumping station. From the pumping station, the crude can be sent to an area refinery for additional processing, to bulk storage tanks for holding, or via pipeline or tanker ships to other areas or countries for refining.

Another term you often hear associated with crude oil is the grade or API number. Generally speaking, "light crude" is more valuable than "heavy crude" because you can extract more fuels and lubricating oils. The API number is used to grade crude; the higher the number, the lighter the crude. Iraqi crude normally has an API number of 27 to 30, which is good, valuable, light crude oil.

From Crude to Refined

Iraq has a number of refineries, so we will follow the crude to one of them. This dry crude still contains five to 10 percent of the "natural gases" and "natural gasoline." The rest of the crude is made up of the compounds that we use to make everything from gasoline to road tar. At the refinery, the dry crude enters distillation columns, also called "fraction towers." Each column has a series of trays that separate the columns into sections. As the crude goes up the tower, the temperatures get cooler. As in any distillation process, the heavy materials settle to the bottom while the lighter products rise. The materials in the very bottom of the refinery column are commonly called just that, "bottoms." These residuals are typically used to make lubricating oil, asphalt, tar, fuel oil and similar products. In Iraq, this material is also frequently used to fire brick kilns for the local construction market. In Iraq, if you see a number of chimneys belching black smoke, you can safely assume they are brick kilns and that a refinery is in the area.

The next tray up the refinery column will catch the heavy naphtha (normally used to produce kerosene and diesel). The next higher tray grabs the light naphtha (primarily used for gasoline). The next higher column grabs the natural gasoline. At the top of the refinery column, and called the "tops," is primarily propane and butane, which are either burned in the refinery flare or sent for use in the production of liquid petroleum gas (LPG).

In the larger refineries, the natural gasoline is run through a chemical reactor called a "reformer" to make a product called "reformate." This is blended with the light naphtha to increase the amount of usable gasoline produced. The light naphtha, or light naphtha-reformate mix, is then blended with an octane-rating booster called TEL (tetraethyl lead). (TEL is no longer used in the United States because it destroys the catalyst in a car's catalytic converter.) The gasoline is then ready to ship to gas stations across the globe.

It's a Gas

Now let's discuss how LPG is made. The gases that come out of the second and third processing stage at the GOSPs (remember them?) are either burned there in a flare or shipped via pipeline to a natural gas liquids (NGL) plant. The NGL plant has distillation towers or columns very similar to those of the oil refinery; they just operate at different temperatures and pressures.

The gas stream from the GOSP is squirted into the tower at the NGL, where once again the heavier materials fall to the bottom and the lighter gases move to the top. Methane, the lightest gas, is pulled out of the top and normally used to run the gas turbines to pressurize and move products in the pipeline system or it is sent to the natural gas pipeline, just like compressor station output. The natural gasoline is recovered and sent back to the oil refinery to produce reformates, or they can be exported. The middle product of the NGL tower, commonly called the "broad cut," is forwarded to a separate LPG plant were it is processed yet again in another distilling tower.

At the LPG plant, the broad cut gases are basically separated into propane and butane. Propane is at the top of the column (lighter gas with a lower boiling point) and butane at the bottom (heavier with a higher boiling point). There are often other gases "hitchhiking" along with the butane and propane; these are separated out and sent to the flare. The propane and butane are usually separated for bulk shipment and storage since they have different temperature and handling properties. The butane and propane are mixed to produce LPG fuel. The actual ratio changes throughout the year. Normally you blend more butane in the winter to increase the heat content of the fuel. But, as with almost everything, there are exceptions to this rule.

OK, did this clear up the basics about petroleum and oil production and refining? Any questions?

Great, then next time we will tackle either Einstein's "Theory of Relativity" or what is the greatest rock and roll song of all time – "Stairway to Heaven" or "Freebird" (my money is on the Carl Douglas classic "Everybody Was Kung Fu Fighting!").

Thanks for tuning in!

Help Wanted: Several key jobs are opening soon for Task Force RIO. Included are: GS-14 Area Engineers, GS-12/13/14 Project Managers and GS-12/13 Project Engineers to work in Iraq, and a GS-12 Accountant to work in Dallas starting in early November. If you are interested and have your supervisor's concurrence, call Jim Barton at 214-767-2370 for more information and possible deployment dates. This is an excellent time to be part of a history making project that is benefiting the people of Iraq.

Back Issues of RIO Update: Have you missed an issue of RIO Update? Go to www.swd.usace.army.mil to view copies of all back issues. Ms. Angela Williams in SWD IM, has been very faithful in maintaining this web page.

"***HOOAH!!***"

MICHAEL L. SCHULTZ, COLONEL, EN
Acting Commander,
Southwestern Division